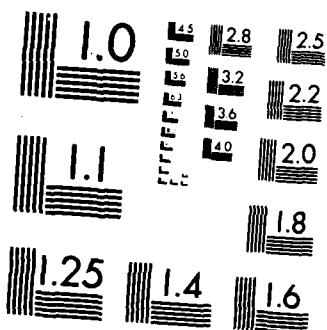


AD-A173 214 ENVIRONMENTAL IMPACT RESEARCH PROGRAM: MANURE SPREADERS 1/1
SECTION 832 US AR. (U) ARMY ENGINEER WATERWAYS
EXPERIMENT STATION VICKSBURG MS ENVIR. T B DOERR
UNCLASSIFIED JUL 86 WES/TR/EL-86-47 F/G 2/3 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

AD-A173 214



US Army Corps
of Engineers



ENVIRONMENTAL IMPACT
RESEARCH PROGRAM

(12)

TECHNICAL REPORT EL-86-47

MANURE SPREADERS

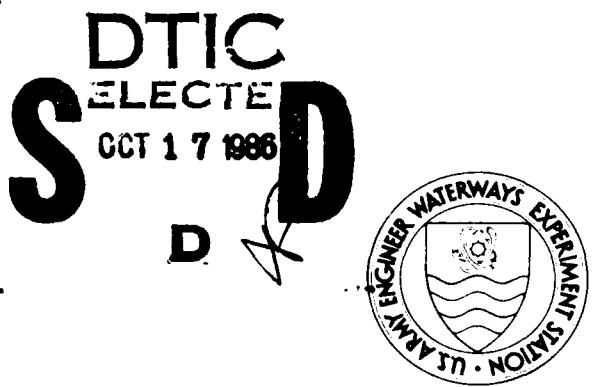
Section 8.3.2, US ARMY CORPS OF ENGINEERS
WILDLIFE RESOURCES MANAGEMENT MANUAL

by

Ted B. Doerr

Environmental Laboratory

DEPARTMENT OF THE ARMY
Waterways Experiment Station, Corps of Engineers
PO Box 631, Vicksburg, Mississippi 39180-0631



July 1986
Final Report

Approved For Public Release. Distribution Unlimited

FILE COPY
MS

Prepared for DEPARTMENT OF THE ARMY
US Army Corps of Engineers
Washington, DC 20314-1000
Under EIRP Work Unit 31631

26 10 10 162

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

Form Approved
OMB No 0704 0188
Exp Date Jun 30 1986

REPORT DOCUMENTATION PAGE *AD-A17321K*

1a REPORT SECURITY CLASSIFICATION Unclassified		1b RESTRICTIVE MARKINGS													
2a SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.													
2b DECLASSIFICATION/DOWNGRADING SCHEDULE															
4 PERFORMING ORGANIZATION REPORT NUMBER(S) Technical Report EL-86-47		5 MONITORING ORGANIZATION REPORT NUMBER(S)													
6a NAME OF PERFORMING ORGANIZATION USAEWES Environmental Laboratory	6b OFFICE SYMBOL (<i>if applicable</i>)	7a NAME OF MONITORING ORGANIZATION													
6c ADDRESS (City, State, and ZIP Code) PO Box 631 Vicksburg MS 39180-0631		7b ADDRESS (City, State, and ZIP Code)													
8a NAME OF FUNDING/SPONSORING ORGANIZATION US Army Corps of Engineers	8b OFFICE SYMBOL (<i>if applicable</i>)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER													
8c ADDRESS (City, State, and ZIP Code) Washington, DC 20314-1000		10 SOURCE OF FUNDING NUMBERS <table border="1"><tr><td>PROGRAM ELEMENT NO</td><td>PROJECT NO</td><td>TASK NO</td><td>WORK UNIT ACCESSION NO</td></tr><tr><td colspan="4">EIRP 31631</td></tr></table>		PROGRAM ELEMENT NO	PROJECT NO	TASK NO	WORK UNIT ACCESSION NO	EIRP 31631							
PROGRAM ELEMENT NO	PROJECT NO	TASK NO	WORK UNIT ACCESSION NO												
EIRP 31631															
11 TITLE (Include Security Classification) Manure Spreaders: Section 8.3.2, US Army Corps of Engineers Wildlife Resources Management Manual															
12 PERSONAL AUTHOR(S) Doerr, Ted B.															
13a TYPE OF REPORT Final report	13b TIME COVERED FROM _____ TO _____	14 DATE OF REPORT (Year, Month, Day) July 1986	15 PAGE COUNT 11												
16 SUPPLEMENTARY NOTATION Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.															
17 COSATI CODES <table border="1"><tr><td>FIELD</td><td>GROUP</td><td>SUB-GROUP</td></tr><tr><td></td><td></td><td>Applicators</td></tr><tr><td></td><td></td><td>Conveyer</td></tr><tr><td></td><td></td><td>Equipment</td></tr></table>	FIELD	GROUP	SUB-GROUP			Applicators			Conveyer			Equipment	18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Manure spreaders Site reclamation Fertilizer		
FIELD	GROUP	SUB-GROUP													
		Applicators													
		Conveyer													
		Equipment													
19 ABSTRACT (Continue on reverse if necessary and identify by block number) An equipment report on manure spreaders is provided as Section 8.3.2 of the US Army Corps of Engineers Wildlife Resources Management Manual. The report is designed to assist the Corps District or project biologist with the selection and use of types of equipment and materials available for habitat development and manipulation. Topics covered include description, operation and maintenance, limitations, and availability.				20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION Unclassified										
22a NAME OF RESPONSIBLE INDIVIDUAL		22b TELEPHONE (Include Area Code)	22c OFFICE SYMBOL												

PREFACE

This work was sponsored by the Office, Chief of Engineers (OCE), US Army, as part of the Environmental Impact Research Program (EIRP), Work Unit 31631, entitled Management of Corps Lands for Wildlife Resource Improvement. The Technical Monitors for the study were Dr. John Bushman and Mr. Earl Eiker, OCE, and Mr. Dave Mathis, Water Resources Support Center.

This report was prepared by Mr. Ted B. Doerr, Range Science Department, Colorado State University, Fort Collins, Colo. Mr. Doerr was employed by the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), under an Intergovernmental Personnel Act contract with Colorado State University during the period this report was prepared. Mr. Chester O. Martin, Team Leader, Wildlife Resources Team, Wetlands and Terrestrial Habitat Group (WTHG), EL, was principal investigator for the work unit. Information on spreaders was provided by personnel from AVCO New Idea Farm Equipment, Coldwater, Ohio; John Deere Company, Moline, Ill.; Schwartz Manufacturing, Lester Prairie, Minn.; and Sperry New Holland, New Holland, Penn. Review and comments were provided by Mr. Martin, WES, and Mr. Larry E. Marcy, Texas A&M University.

The report was prepared under the general supervision of Dr. Hanley K. Smith, Chief, WTHG, EL; Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL; and Dr. John Harrison, Chief, EL. Dr. Roger T. Saucier, WES, was Program Manager, EIRP. The report was edited by Ms. Jessica S. Ruff of the WES Information Products Division (IPD). Drawings were prepared by Mr. John R. Harris, Scientific Illustrations Section, IPD, under the supervision of Mr. Aubrey W. Stephens, Jr.

COL Allen F. Grum, USA, was the previous Director of WES. COL Dwayne G. Lee, CE, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

This report should be cited as follows:

Doerr, Ted B. 1986. "Manure Spreaders: Section 8.3.2, US Army Corps of Engineers Wildlife Resources Management Manual," Technical Report EL-86-47, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.



Availability Codes	
Dist	Avail a d/or Special
A-1	

NOTE TO READER

This report is designated as Section 8.3.2 in Chapter 8 -- EQUIPMENT, Part 8.3 -- SOIL AMENDMENT EQUIPMENT, of the US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL. Each section of the manual is published as a separate Technical Report but is designed for use as a unit of the manual. For best retrieval, this report should be filed according to section number within Chapter 8.

MANURE SPREADERS

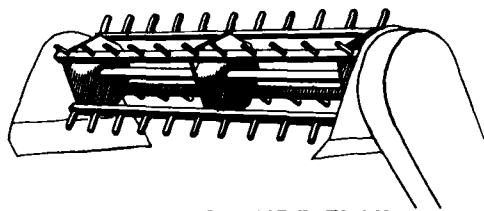
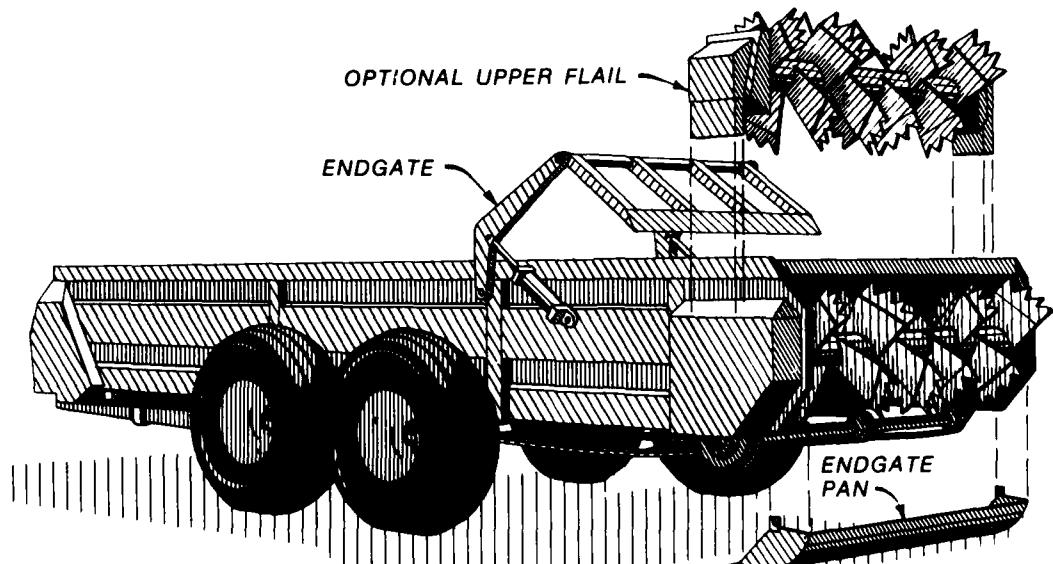
Section 8.3.2, US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL

DESCRIPTION	3	LIMITATIONS	5
OPERATION	5	AVAILABILITY	7
MAINTENANCE	5	LITERATURE CITED	8

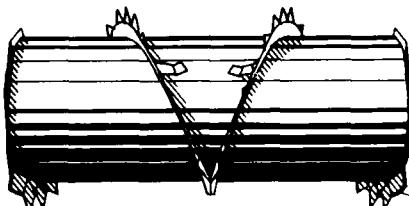
Manure spreaders are designed to apply manure and other organic solids to the soil surface. They are rectangular-shaped trailers pulled by a 30- to 100-hp tractor (Larson 1980, Sperry New Holland 1983). Manure and organic matter applications are used to improve soil aeration, water-holding capacity, fertility, and organic matter content to enhance plant establishment and growth. Spreaders are used throughout the United States for agriculture and reclamation where soils need more intensive renovation than can be provided by simple tillage and inorganic amendments.

DESCRIPTION

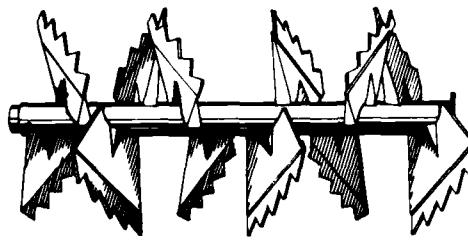
Manure spreaders are modified single- and dual-axle trailers with solid sides. The bottom is a conveyor belt (apron) that moves material toward the rear, where the rotary flails beat, break up, and distribute the organic solid (Fig. 1). The bottom flail mechanism is either a large drum with short replaceable teeth or a thin drum or shaft with large replaceable teeth. The optional upper flail is also a thin drum with large replaceable teeth (Schwartz Manufacturing 1983; John Deere Company 1983). Some manure spreaders have a third optional "wide spread" flail to facilitate even spreading of organic material (Sperry New Holland 1983). Flails and conveyors are usually powered by power-take-off (PTO) systems. The John Deere 450 Hydra-push spreader uses a hydraulically powered push board to move organic material to the rear of the trailer. This reduces cleanup and maintenance requirements (John Deere Company 1983).



STRAW-MANURE FLAIL



DRUM FLAIL



PADDLE FLAIL

**Figure 1. Basic manure spreader design, showing flail types available
(adapted from materials provided by John Deere Company,
AVCO New Idea, and Sperry New Holland)**

Trailers vary in size, and load capacities range from 64 cu ft (Larson 1980) to 570 cu ft (Sperry New Holland 1983). Endgates allow fluid manure and solid organic material to be loaded off-site and transported to the treatment area with minimal material loss. A detachable slurry pan located beneath the bottom flail can be used to improve distribution of more fluid material (Fig. 1). Further specifications are presented in Table 1.

OPERATION

The manure spreader is loaded by a front-end loader or conveyor system at a material storage pile. The material is moved to the flails at the rear of the spreader by a conveyor belt or push panel. The application rate is determined by the speed of the tractor and the speed of the conveyor belt moving the material. Spreaders should be calibrated to ensure accurate application rates before use. Most manure spreaders have variable conveyor speeds. Material can either be left on the soil surface, crimped (to keep in place), or incorporated into the soil by rototilling or disking.

Application of organic material with high levels of wood residue may create an imbalance in the carbon-nitrogen ratio. This imbalance will limit plant-available nitrogen. Therefore, higher rates of nitrogen fertilizer may be required than estimates based on soil tests. If sewage sludge is being applied, nutrient levels, cation-exchange capacity, electrical conductivity, and heavy metal levels should be measured prior to use. These tests will show nutrient deficiencies, salt levels, and toxic substances detrimental to vegetation establishment.

MAINTENANCE

Manure spreaders should be cleaned after each use. Conveyors, chains, flail teeth, and PTO systems should be checked and repaired following manufacturers' specifications. Periodic lubrication of moving parts is required.

LIMITATIONS

Manure spreaders are not adapted for use on areas with rough topography, shallow rocky soils, or brush. Site preparation techniques (brush control, disking, etc.) need to be applied before manure spreaders can be used on these sites. For most projects, rotary spreaders are more useful than manure

Table 1. Specifications for several brands of manure spreaders

Feature	Deere Hydra-push	John Deere	Schwartz	Sperry New Holland	AVCO New Idea
Box capacity					
Struck	142 cu ft	77-245 cu ft	76-203 cu ft	71-340 cu ft	84-356 cu ft
Heaped	286 cu ft	178-471 cu ft	154-368 cu ft	139-570 cu ft	174-596 cu ft
Dimensions (overall)					
Width	7.9 ft	6.8-9.0 ft	5.7-8.0 ft	6.5-10.3 ft	7.3-10.7 ft
Length	19.3 ft	16.6-24.6 ft	15.6-23.2 ft	14.7-26.3 ft	16.0-24.8 ft
Height	4.4 ft	3.8-4.4 ft	3.7-5.8 ft	3.8-6.9 ft	4.7-6.8 ft
Conveyor speed settings	multiple	1-3	2 or 7	2 plus	1 or 5
Operation speed	5-6 mph	5-6 mph	3-6 mph	5 mph	5 mph
Power requirements	60 hp	50-80+ mph	30-85 hp	20-135 hp	40-125 hp
Attachments	Upper flail Endgate Endgate pan	Upper flail Endgate Endgate pan Flail shield	Upper flail Endgate Endgate pan	Upper flail Endgate Endgate pan "Wide spread" flail	Upper flail Endgate Endgate pan

spreaders unless the site requires organic amendments to restore productivity; large quantities of organic material must also be available.

AVAILABILITY

Manure spreaders and associated equipment are available from the following retailers:

AVCO New Idea Farm Equipment 420 S. First Street Coldwater, Ohio 45828	International Harvester Agricultural Equipment Div. 401 N. Michigan Avenue Chicago, Illinois 60611
John Deere Company John Deere Road Moline, Illinois 61265	Schultz Manufacturing Company P. O. Box 388 Waterloo, Iowa 50704
Ford Tractor Operations 2500 E. Maple Road Troy, Michigan 48024	Schwartz Manufacturing P. O. Box 248 Lester Prairie, Minnesota 55354
Gehl Company 143 E. Water Street West Bend, Wisconsin 53095	Sperry New Holland 500 Diller Avenue New Holland, Pennsylvania 17557

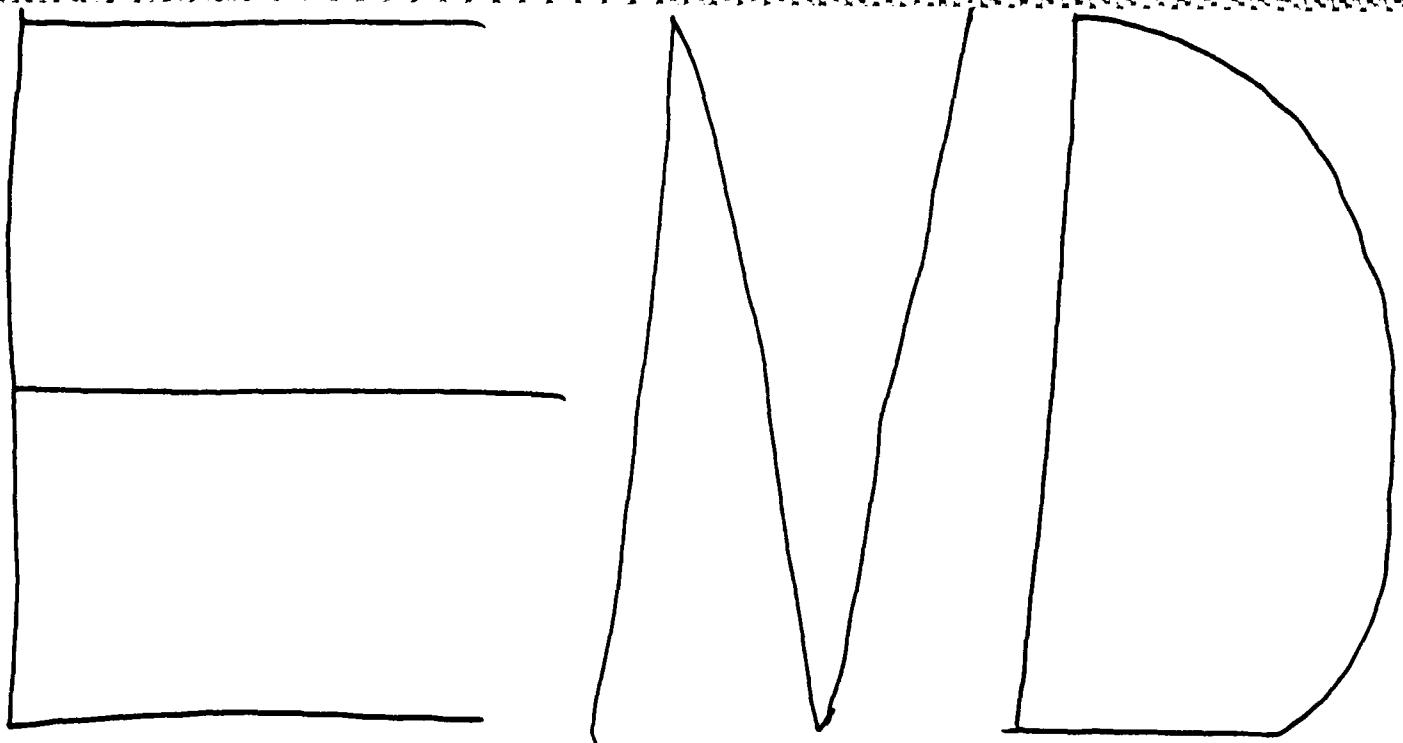
LITERATURE CITED

John Deere Company. 1983. Loaders, spreaders, and rear blades. Specification sheet, Moline, Ill. 43 pp.

Larson, J. E. 1980. Revegetation equipment catalogue. USDA For. Serv. Equipment Development Center, Catalogue No. 8042 2501. 198 pp.

Schwartz Manufacturing. 1983. Manure spreaders. Specification sheet. Lester Prairie, Minn. 5 pp.

Sperry New Holland. 1983. Box spreaders. Specification sheet. New Holland, Penn. 5 pp.



2-86

